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DEVELOPMENT OF COMPUTER SIMULATION MODEL DEVELOPS CREATIVE THINKING OF THE STUDENT

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ABSTRACT:

Highlighting the features of the concept with the help of animation, the simulation model has the ability to demonstrate these features through the action inherent in this concept. This is especially important for trainees, because they primarily distinguish as distinctive features of the concepts of their action.

The dynamics of the simulation model is not only used to show the movement of the object, but also reveals the logic of the movement of thought from ignorance to knowledge.

Keywords: Simulation model, animation, creative thinking. Logical thinking, virtual laboratory, multimedia technology.

INTRODUCTION:

The peculiarity of the demonstration of the simulation model is that it is always based on the image, not the word. Therefore, the logic of the development of thought cannot be fully disclosed with the help of verbal explanations (author's text).

The processes of concept formation by means of analysis, comparison, allocation of essential features and other logical operations are revealed in a developer-specific animation form.

Here are some examples. In the simulation, you can select one of the objects or part of the object by stroking or highlighting. For this purpose, a contrasting contour line, hatching or flickering stands out one or another image. The developer uses this technique to analyze or compare individual parts. At the same time, in necessary cases, animation materials are possible, fixing the visual image in the word. Transitions from the General plan to the large or Vice versa allow you to highlight the essential, compare certain judgments to obtain a new conclusion, etc.

Thus, the dynamics of the simulation model is not only used to show the movement of the object, but also reveals the logic of the movement of thought from ignorance to knowledge.

By highlighting the features of a concept through animations, the simulation model has the ability to demonstrate these features through the action inherent in the concept. This is especially important for the trainees, because they first of all distinguish as distinctive features of the concepts of their action ("Bird that flies", "Car that drive", etc.). Further differentiation of concepts and the difference of essential features from random and secondary, is achieved by a more complex way of knowledge and learning. However, in the individual development of the personality every time there is anew a need for an effective

approach to familiarization with a new subject. It is this need that is best met through the dynamic visibility of the simulation model.

If under the microscope, the teacher with great difficulty can show the characteristic features in the structure of amoebas and other protozoa (movement, nutrition, reproduction and formation of cysts), then in the simulation model, these differences acquire an effective, well-perceived and memorable character with the help of animated material. Therefore, the teacher, when previewing the simulation model, must accurately highlight the features of the reported information, in order to work with the audience to focus the attention of students on the animation material, which is determined by the developer of the simulation model.

In the above case, the teacher, when fixing the animation material, pays attention to the properties characteristic, for example, of an amoeba. He asks to talk about the structure, movement, nutrition, reproduction of the amoeba and describe it in words that correspond to a certain frame from the animation.

Thus, students receive additional and very valuable information that will simultaneously contribute to the development of logical thinking. In this case we are dealing with the logical operation of dividing the concept. The concept of "amoeba" was divided into several narrow concepts: structure, movement, nutrition, reproduction.

Students are able to understand the classification system in the natural Sciences if, along with the verbal definition of the essential features of certain taxonomic units, they will have in mind the corresponding real visual images. The more closely connected in the consciousness of verbal symbols and images, the more complete will be the assimilation of student's classification. Therefore simultaneous or quickly following one after another presentation of a verbal designation and an image has essential value [2-3].

Without the support of the image, this operation can be extremely difficult. Here is an example. Students can see the joint on an anatomical table or in a simulation model. In the latter case, all parts of the joint are distinguished in two ways: by a gradual anatomical dissection of the real joint, or then a schematic dissection using animation. In contrast to the table animation allows you to consider the parts of the joint (joint bag, joint head and joint cavity) and its work. Therefore, working with the use of animation, the teacher should use the opportunity to create an idea of the whole organ-the joint and its division into separate parts, functionally connected by the unity of the organ itself. Thinking over the methodology of classes, the teacher should pay special attention to the development of the concept of the part and the whole in its functional understanding and unity.

For more complex systems, there is a need for gradual analysis and then synthesis of parts into a whole. Teachers know that without the use of animations, they cannot clearly explain to students the work of the hearing organ. The simulation model with its dynamic visibility helps to lay quite clear and correct ideas about the interaction of parts of a complex system.

In this case, as in many similar ones, the thought process goes along the lines of analysis, isolation of individual parts of a complex system, and then synthesis, connection of these individual parts into a single working mechanism. To ensure these two processes in the simulation model is pre-visual dismemberment-analysis, and then combined together-synthesis. It is in this way that the development of action in the simulation model "human hearing Organ" is constructed (Fig. 1).

First, the hearing organ is divided into three parts: the inner, middle and outer ear. Then each separate part of the hearing organ is taken out of its place and shown separately. The eardrum is isolated and rotated to show in all angles. The tweezers included in the simulation model take out and from all sides shows the bones of the middle ear. For the purpose of morphological and physiological analysis of the inner ear, the analysis is performed by turning figures in different planes, anatomical sections performed in front of the audience, enlargements from macro to micro planes. The analysis is followed by a synthesis in which the interactions of the individual constituent parts are considered [1-5].

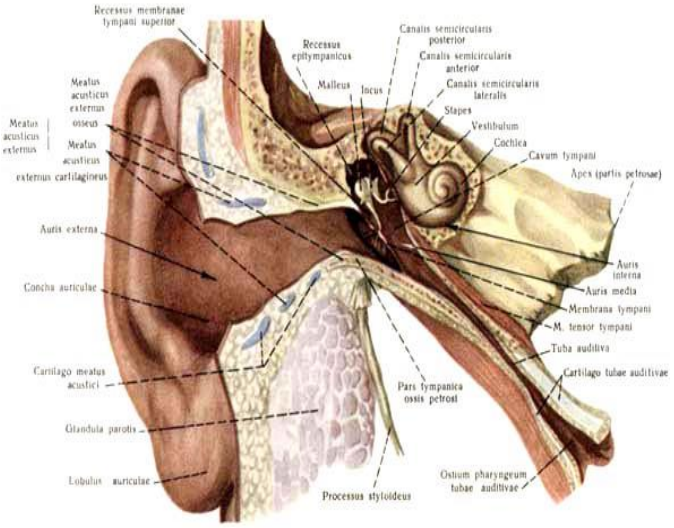

Fig. 1. Outer, middle and inner ear (right).

Simulation model

Visual dismemberment and then connection are only stages on the way to the thought process of analysis and synthesis.

The teacher brings the assimilation of the material started by the simulation model to the worked-out, more generalized form of theoretical consideration of structures during oral analysis in the classroom.

The simulation model makes it possible to sense not only the individual objects of nature, but also the nature of their development and relationships, the logic of life processes.

From this point of view, the most important statement for didactics by K. D. Ushinsky that the logic of nature is the most accessible to people logic, visual and irrefutable, acquires a special meaning. Ushinsky thus has in mind the continuity of the connection of the General and the individual, the abstract and the concrete, reflected in the real objects of nature. In any single subject, the teacher must find and point out to students the General in the directly given phenomenon, help to see the essence, the law. Only in the individual, the General acquires its visual expression, most accessible to the understanding of the student. Getting acquainted with the phenomena of nature, students get the most visual, real, and therefore irrefutable idea of the universal-the logic of nature itself [4].

Since Ushinsky's time pedagogy in the field of use of computer means of training has gone far ahead. Many processes that are not available for direct study in nature, have become objects of the system of visualization, carried out by means of information technologies. This applies to the processes that occur in the microcosm, to the phenomena that occur under water, at the bottom of the seas and oceans, in space, in distant geographical areas. It became possible to observe what is happening in the organ, the organ system and the body as a whole, beyond the reach of the simple eye cells and their organoids, tissues, etc.

Nature is studied not only in nature, but also through the image of phenomena and processes occurring in reality with the help of information computer technologies.

However, the developed computer simulation models are not a simple addition to the impressions that can be directly derived from reality. Reflected in the simulation model

not only reproduces something seen in nature, but also expresses a certain attitude to the reproduced, with the help of specific means of information technology reveals its logic.

The idea of a simulation model is born by comparing objects in certain relationships. I. p. Pavlov, describing the process of thinking, said that thinking to a certain point is nothing else, as an Association, first elementary, standing in connection with external objects, and then a chain of associations. So, every small, first Association is the moment of the birth of thought.

It is interesting to compare the thought of I. p. Pavlov with the analysis of ways of communicating thought in the simulation model developed under the guidance of doctor of pedagogical Sciences, Professor M. H. Lutfillaev and his students. In one of the simulation models, for example, photosynthesis, the developers pieced together the process when the plastids of the leaf under the influence of light in stages, first in the light phase, and then in the dark phase are processes invisible to the eye: the formation of carbohydrates, ATP, CO2 absorption and O2 release into the external environment. The authors presented the training material as a system of bright reference images filled with comprehensive structured information in a logical order. In this case, different channels of perception of students are involved, which allows you to put information not only in fact, but also in an associative form in the memory of students [4] .

The simulation model seems to absorb the modern method of problem presentation. At the same time, due to the special capabilities of the simulation model, elements of information are introduced that are inherent only in the simulation model and are impossible when the teacher verbally presents the material (Fig. 2).

In the simulation model, dedicated to the fertilization step by step, demonstrates the steps of the process: distant interaction of gametes (sex cells), when hamony of gametes (antognoni and gingaman) contribute to convergence of cells, then the contact interaction, when the sperm penetrates the egg and forms a shell of fertilization, and finally the third stage showing the processes taking place in the fertilized egg (zygote). Thus, a particular emotion, clarity in the formulation and solution of problems doing a simulation model is an indispensable tool that offers the students the complexity and beauty of research and thought-through together with the researcher, the successes and failures of the experiment, grasp the essence of the problem.

SPERMATOGENESIS:

The aim is to show the process of development of the male sex cell

This virtual laboratory demonstrates the development of sperm (Mature germ cell) from spermatogonia (primary germ cell) in the testis (male sex gland) with the help of SKM.

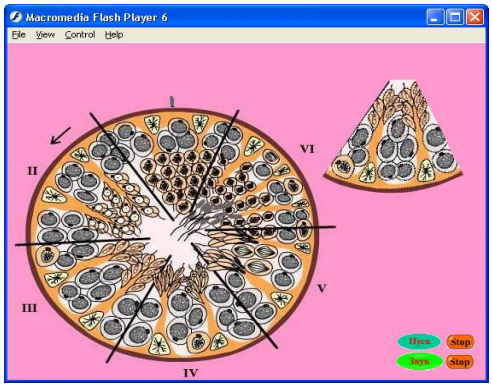

Fig. 2. Process of development of the male sex cell

Fig. 3. Computer simulation model for the development of male reproductive cells

The course of work-Computer simulation demonstrates the cut of the seminal tubule, where the process of spermatogenesis takes place. The process of transformation of dividing primary germ cells into Mature spermatozoa is called spermatogenesis and this process consists of a number of radical structural transformations

When the positioning of the simulation model the teacher along with the questions presented on the merits of the topic, specifies a number of methodological questions, such as what type of work in the classroom you prefer, i.e. what you like to do (group work, work in pairs, alone, to experiment, to prepare and execute projects, study material by using computer technology to study the material using the textbook, other (specify what); what type of knowledge test you prefer: orally, in writing, using the computer; the new material is more understandable to you if the teacher explains it with the help of: additional literature, tables, textbook, video, computer). The results of this survey show that the use of a computer, simulation models at different stages of the lesson helps students in the development and systematization of new knowledge (Fig**.** 3).

Thus, these examples show that the meaning of methodological techniques aimed at the development of logical thinking of students is not limited to obtaining final conclusions and formulations. With the help of the simulation model, the teacher seeks to reveal the essence of the problem approach to research, the features of scientific methods, to create a sense of the value of the data obtained. The teacher should make every effort to ensure that the methodological techniques associated with the use of the simulation model, make activity and emotionality in the perception of the logic of scientific thinking.

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